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NATIONAL DAM SAFETY PROGRAM. GOLDEN EAGLE LAKE DAM (MO 10920), --ETC(U)
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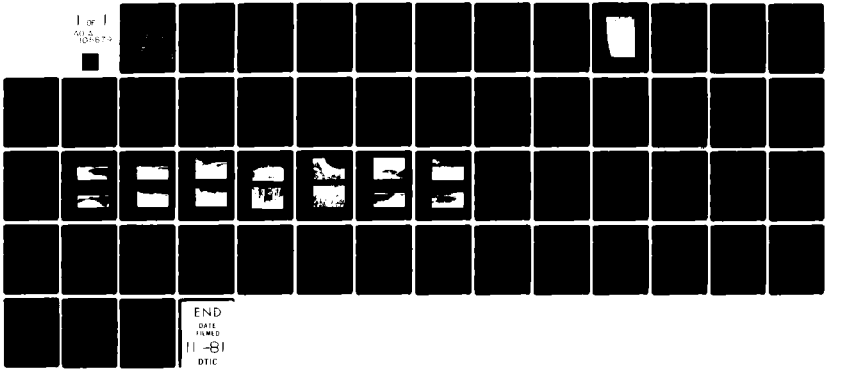

LEVEL II

MISSISSIPPI-KASKASKIA-ST. LOUIS BASIN

GOLDEN EAGLE LAKE DAM

MONTGOMERY COUNTY, MISSOURI

MO. 10920

PHASE 1 INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM

United States Army
Corps of Engineers
...Serving the Army
...Serving the Nation

St. Louis District

PREPARED BY: U.S. ARMY ENGINEER DISTRICT, ST. LOUIS

FOR: STATE OF MISSOURI

JUNE, 1979

UNCLASSIFIED

SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

REPORT DOCUMENTATION PAGE	READ INSTRUCTIONS BEFORE COMPLETING FORM
1. REPORT NUMBER	2. GOVT ACCESSION NO. AD-A105 679	3. RECIPIENT'S CATALOG NUMBER
4. TITLE (and Subtitle) ~~Phase I Dam Inspection Report~~ National Dam Safety Program. Golden Eagle Lake Dam (MO 10920), Montgomery County, Missouri, Mississippi-Kaskaskia-St. Louis Basin, Phase I Inspection Report.	5. TYPE OF REPORT & PERIOD COVERED Final Report
7. AUTHOR(s) Hoskins-Western-Sonderegger, Inc.	8. CONTRACT OR GRANT NUMBER(s) DACW43-79-C-0046
9. PERFORMING ORGANIZATION NAME AND ADDRESS U.S. Army Engineer District, St. Louis Dam Inventory and Inspection Section, LMSED-PD 210 Tucker Blvd., North, St. Louis, Mo. 63101	10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS
11. CONTROLLING OFFICE NAME AND ADDRESS U.S. Army Engineer District, St. Louis Dam Inventory and Inspection Section, LMSED-PD 210 Tucker Blvd., North, St. Louis, Mo. 63101	12. REPORT ~~DATE~~ June 1979 13. NUMBER OF PAGES Approximately 55
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19. KEY WORDS (Continue on reverse side if necessary and identify by block number) Dam Safety, Lake, Dam Inspection, Private Dams	
20. ABSTRACT (Continue on reverse side if necessary and identify by block number) This report was prepared under the National Program of Inspection of Non-Federal Dams. This report assesses the general condition of the dam with respect to safety, based on available data and on visual inspection, to determine if the dam poses hazards to human life or property.	

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SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

DEPARTMENT OF THE ARMY
ST. LOUIS DISTRICT, CORPS OF ENGINEERS
210 TUCKER BOULEVARD, NORTH
ST. LOUIS, MISSOURI 63101

REPLY TO ATTENTION OF

LMSED-P

SUBJECT: Golden Eagle Lake Dam Phase I Inspection Report

This report presents the results of field inspection and evaluation of the Golden Eagle Lake Dam.

It was prepared under the National Program of Inspection of Non-Federal Dams.

This dam has been classified as unsafe, non-emergency by the St. Louis District as a result of the application of the following criteria:

1) Spillway will not pass 50 percent of the Probable Maximum Flood without overtopping the dam.
2) Overtopping could result in dam failure.
3) Dam failure significantly increases the hazard to loss of life downstream.

SUBMITTED BY: SIGNED — 14 MAR 1980
Chief, Engineering Division — Date

APPROVED BY: SIGNED — 14 MAR 1980
Colonel, CE, District Engineer — Date

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GOLDEN EAGLE LAKE DAM
MONTGOMERY COUNTY, MISSOURI
MISSOURI IDENTIFICATION NO. 10920

PHASE I INSPECTION REPORT

NATIONAL DAM SAFETY PROGRAM

PREPARED BY
HOSKINS-WESTERN-SONDEREGGER, INC.
CONSULTING ENGINEERS
LINCOLN, NEBRASKA

UNDER DIRECTION OF

ST. LOUIS DISTRICT, CORPS OF ENGINEERS

FOR

GOVERNOR OF MISSOURI

JUNE, 1979

PHASE I INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM

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PHASE I INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM
ASSESSMENT SUMMARY

Name of Dam	Golden Eagle Lake Dam
State Located	Missouri
County Located	Montgomery County
Stream	Tributary Cedar Creek
Date of Inspection	June 28, 1979

Golden Eagle Lake Dam was inspected by an interdisciplinary team of engineers ~~from Hoskins-Western-Sonderegger, Inc~~. The purpose of the inspection was to make an assessment of the general condition of the dam with respect to safety, based upon available data and visual inspection, in order to determine if the dam poses hazards to human life or property.

The guidelines used in the assessment were furnished by the Department of the Army, Office of the Chief of Engineers, and developed with the help of several Federal and State agencies, professional engineering organizations, and private engineers. Based on these guidelines, this dam is classified as an intermediate size dam with a high downstream hazard potential. Failure would threaten life and property. The estimated damage zone extends approximately two and one-half miles downstream of the dam. Included in the damage zone are eight vacation type dwellings and two Highway "F" road crossings.

Our inspection and evaluation indicates that the spillways do not meet the criteria set forth in the recommended guidelines for an intermediate dam having a high hazard potential. The Probable Maximum Flood is the appropriate spillway design flood. The spillways will pass the 100-year flood (flood having a one percent chance of being exceeded in any year) without overtopping the dam. The spillways will pass 29% of the Probable Maximum Flood without overtopping of the dam. The Probable Maximum Flood (PMF) is defined as the flood that may be expected from the most severe combination of critical meteorologic and hydrologic conditions that are reasonably possible in the region.

No design data were available for this dam. Seepage and stability analyses comparable to the requirements of the "Recommended Guidelines for Safety Inspection of Dams" were not available, which is considered a deficiency. These analyses should be obtained in the future.

Other deficiencies observed during the inspection are a few small trees growing on the upstream slope, and many trees and shrubs growing on the downstream slope and in the downstream channel.

Maintenance of the dam is generally good except for tree and brush growth. Preventative maintenance measures relating to tree and brush removal need to be initiated by the owner.

Rey S. Decker
E-3703

Gordon Jamison

Harold Ulmer
Garold Ulmer
E-4777

H. P. Hoskins
Harold P. Hoskins
Chairman of Board
Hoskins-Western-Sonderegger, Inc.
E-8696

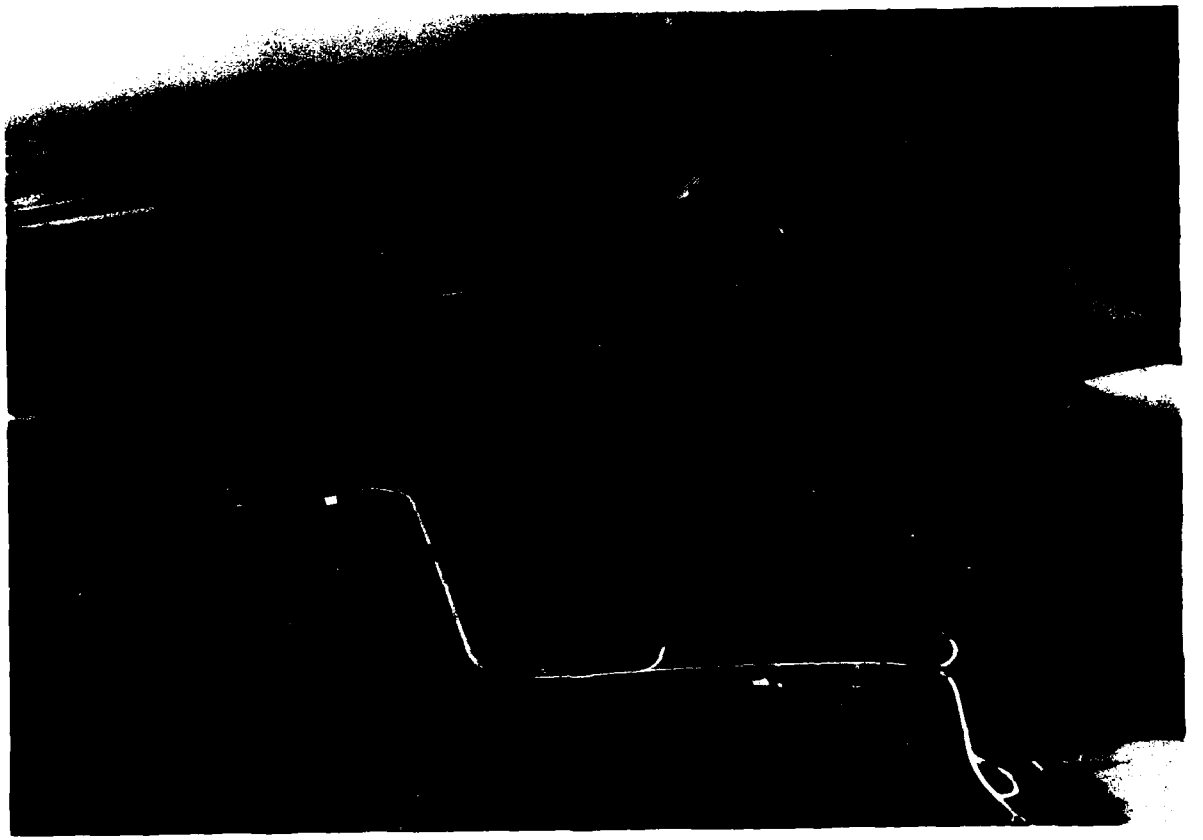


PHOTO NO. 1 - OVERVIEW

PHASE I INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM
GOLDEN EAGLE LAKE DAM - MO 10920
MONTGOMERY COUNTY, MISSOURI

SECTION 1 - PROJECT INFORMATION

1.1 GENERAL

a. Authority. The National Dam Inspection Act, Public Law 92-367, authorized the Secretary of the Army, through the Corps of Engineers, to initiate a program of safety inspection of dams throughout the United States. Pursuant to the above, the St. Louis District, Corps of Engineers, District Engineer directed that a safety inspection of Golden Eagle Lake Dam be made.

b. Purpose of Inspection. The purpose of the inspection was to make an assessment of the general condition of the dam with respect to safety, based upon available data and visual inspection, in order to determine if the dam poses hazards to human life or property.

c. Evaluation Criteria. Criteria used to evaluate the dam were furnished by the Department of the Army, Office of the Chief of Engineers, in "Recommended Guidelines for Safety Inspection of Dams," Appendix D to "Report of the Chief of Engineers on the National Program of Inspection of Dams," dated May, 1975, and published by the Department of the Army, Office of the Chief of Engineers.

1.2 DESCRIPTION OF PROJECT

a. Description of Dam and Appurtenances.

(1) The dam is an earth fill about 1340 feet in length with maximum height of about 33 feet and nominal height above flood plain of 26 feet. Topography of the area is gently rolling with moderately steep valley slopes. A thin mantle of loess covers the uplands. Slopes and abutments generally consist of sandy and gravelly clay soils derived from glacial till.

(2) The principal spillway is uncontrolled and consists of a 24 inch diameter steel pipe with a 6 foot diameter steel riser.

(3) A vegetated earth emergency spillway is cut through the left abutment and is uncontrolled.

(4) Pertinent physical data are given in paragraph 1.3 below.

b. Location. The dam is located in the east central portion of Montgomery County, Missouri, as shown on Plate A-2. The dam is shown on Plate A-1 in the SW¼ of Section 16, T48N, R4W. The lake formed behind the dam is shown in the S½ of Section 16, T48N, R4W, the W½ of Section 21, T48N, R4W, the N½ of NE¼ of Section 21, T48N, R4W and the W½ of SE¼ of Section 21, T48N, R4W.

c. Size Classification. Criteria for determining the size classification of dams and impoundments are presented in the guidelines referenced in paragraph 1.1c above. Based on these criteria, this dam and impoundment is in the intermediate size category.

d. Hazard Classification. Guidelines for determining hazard classification are presented in the same guidelines as referenced in paragraph 1.1c above. Based on referenced guidelines, this dam is in the High Hazard Classification. The estimated damage zone extends about two and one-half miles downstream of the dam. Included in the damage zone are 8 vacation type dwellings and two Highway "F" road crossings.

e. Ownership. The dam is owned by Clayton Commodity Service, 7 North Brentwood Blvd., St. Louis, Missouri 63105, c/o Roy Longstreet.

f. Purpose of Dam. The dam forms a recreational lake covering some 106 acres.

g. Design and Construction History. It is not known when the dam was constructed. No design information was available. It was reported by Mr. Walter Schmieder, temporary manager, that the principal spillway was altered about 3 years ago when the riser was added to the pipe inlet and additional riprap was applied to the upstream face. Prior to the alteration, the 24 inch pipe extended into the reservoir and was equipped with a hooded inlet.

h. Normal Operating Procedure. There are no regulating facilities for this dam other than a valve controlled 6-inch drawdown pipe. The reservoir level is controlled by rainfall, infiltration, evaporation and the capacity of the spillways.

1.3 PERTINENT DATA

a. Drainage Area. 1,287 acres (2.01 square miles).

b. Discharge at Damsite.

(1) All discharges at the damsite are through a principal spillway (6' diameter steel-pipe riser connected to a 24 inch steel-pipe outflow tube) and an emergency spillway (uncontrolled earthen irregular trapezoidal shaped channel).

(2) Estimated maximum flood at damsite -- unknown.

(3) The principal spillway capacity varies from 0 c.f.s. at elevation 818.0 feet to 66 c.f.s. at the crest of the emergency spillway (elevation 820.0 feet).

(4) The emergency spillway capacity varies from 0 c.f.s. at its crest elevation 820.0 feet to 1010 c.f.s. at elevation 823.2 feet (top of dam).

(5) Total spillway capacity at the minimum top of dam is 1080 c.f.s. ±.

c. Elevations (feet above M.S.L.).

(1) Top of dam - 823.2 (nominal); 822.7 (min.); 823.7 (max.)
(2) Principal spillway crest - 818.0
(3) Emergency spillway crest - 820.0
(4) Streambed at centerline - 790±
(5) Maximum tailwater - unknown

d. Reservoir. Length (feet) of maximum pool - 5,500±.

e. Storage (acre-feet)

(1) To Principal Spillway Crest - 990±
(2) Principal Spillway Crest to Top of Dam - 740±

f. Reservoir Surface (Acres).

(1) Top of Dam - 150±
(2) Principal spillway crest - 106±

g. Dam.

(1) Type - Earth fill
(2) Length - 1340 feet ±

(3) Height - Maximum = 33 feet±, nominal =26 feet±(measured)
(4) Top width - 15 feet±
(5) Side slopes.
    (a) Downstream - 3.1H on 1V (measured)
    (b) Upstream - 3.4H on 1V to berm (measured)

(6) Zoning - unknown
(7) Impervious core - unknown
(8) Cutoff - unknown
(9) Grout curtain - unknown
(10) Wave protection - Limestone riprap and berm

h. Diversion Channel and Regulating Tunnel. None

i. Spillway.

(1) Principal

(a) Type - uncontrolled drop inlet with 6 foot diameter steel riser and 24 inch diameter steel outlet conduit passing through the embankment.
(b) Riser Crest Elevation - 818.0 ft.
Conduit:
Inlet Invert - 813.4 ft.
Outlet Invert - 792.8 ft.
(c) Length - 116 feet±

(2) Emergency

(a) Type - Vegetated earth, uncontrolled, on left abutment, trapezoidal section.
(b) Control section - Very well vegetated level section 175 feet± in length with bottom width of 40 feet± and side slopes of about 14H on 1V outside and 8H on 1V inside (dam side).

(c) Crest Elevation - 820 feet±
(d) Upstream Channel - Clear, very well vegetated
(e) Downstream Channel - Very well vegetated with exit channel on slope of about 3%.

j. Regulating Outlets - There is a 6-inch steel drawdown pipe through the dam. It is operated by a valve in a manhole located approximately 15 feet upstream and 15 feet west of the principal spillway outlet.

SECTION 2 - ENGINEERING DATA

2.1 DESIGN

No design data were available for this dam.

2.2 CONSTRUCTION

No construction data were available. It was reported by Mr. Walter Schmieder, temporary manager, that the riser was added to the principal spillway in 1976. Additional riprap was also applied on the upstream slope at that time.

2.3 OPERATION

No data were available on spillway operation. It was reported by Mr. Schmieder that the emergency spillway has never operated. He also reported that the reservoir raised to about elevation 820 in the spring of 1979, the highest level observed to date.

2.4 EVALUATION

a. Availability. No data were available.

b. Adequacy. The field surveys and visual observation presented herein are considered adequate to support the conclusions of this report. Seepage and stability analyses comparable to the requirements of the "Recommended Guidelines for Safety Inspection of Dams" were not available, which is considered a deficiency. These seepage and stability analyses should be performed for appropriate loading conditions (including earthquake loads) and made a matter of record.

c. Validity. Not applicable.

SECTION 3 - VISUAL INSPECTION

3.1 FINDINGS

a. General. A visual inspection of the Golden Eagle Lake Dam was made on June 28, 1979. Engineers from Hoskins-Western-Sonderegger, Inc., Lincoln, Nebraska, making the inspection were: R. S. Decker, Geotechnical; Gordon Jamison, Hydrology; Garold Ulmer, Civil Engineer.

b. Dam.

(1) Project Geology. General geology at the site consists of glacial till overlying limestone (probably Keokuk or Burlington) at some unknown depth. No bedrock was exposed in the area. Soils on the left abutment consist of clay (CH) with some cherty gravel. Auger borings on the dam showed dry CL or CH soil down to about 1 foot with moist CH soils down to 2-3 feet.

Materials in the right abutment are probably loessial colluvium overlying glacial till. Foundation materials in the valley bottom consist of CL-CH alluvium and/or glacial till.

(2) Upstream Slope. The upstream slope looks very good. It is well riprapped with durable limestone up to about elevation 820 (emergency spillway elev.). Nominal size of riprap is 8 to 12 inches. The slope is well vegetated above the riprap. A few small trees are growing at the water's edge. No rodent holes, slides or deformations were noted on the upstream face.

(3) Crest. The crest is well vegetated with adapted grasses. The roadway across the top is not surfaced and apparently is used only for maintenance purposes. A few drying cracks, up to 1/4 inch wide and 2 to 3" in depth, were observed. This would be expected in the CL or CH materials in the embankment. No rodent holes or deformations were observed on the crest.

(4) Downstream Slope. The downstream slope has a great many trees and shrubs growing over most of the face with good grass cover between the trees and shrubs. No rodent holes, slides, or abnormal deformations were noted on the slope. There was no indication of emergence of the phreatic line on the slope nor any sign of seepage at or below the toe of the dam. Most of the trees on the back slope were hard woods. No willows or other water loving plants were observed.

(5) Miscellaneous. There is no evidence to indicate that this dam has ever been overtopped.

c. Appurtenant Structures.

(1) Principal spillway. No deterioration was noted in the steel riser or the outlet pipe. The inlet was clear and open without trash. The scour hole at the outlet end was eroded into CL or CH soil and appeared to be stable. The reservoir level was about 4 inches below the inlet elevation of the riser when inspected.

(2) The emergency spillway is very well vegetated throughout its length. There are a few small trees and brush growing in the inlet to the spillway. No slips, slides or erosion was apparent in the spillway bottom or on the sides. Clay (CH) soils are present in the outside channel bank. The trash line in the entrance channel indicates that the reservoir level has approached spillway operation. Discharge from the emergency spillway should not endanger the safety of the dam. There was no evidence of flows through the spillway.

(3) Drawdown facilities consist of a 6 inch diameter cast iron pipe passing through the embankment just left (west) of the principal spillway pipe. A valve is located at the lower end. The valve appeared to be operable and was barely dripping.

d. Reservoir Area. No significant wave wash, slides or slumps were observed around the shoreline. The water in the reservoir was quite cloudy and discolored with colloids.

e. Downstream Channel. The downstream channel is overgrown with trees and shrubs. It appears to be stable.

3.2 EVALUATION

This dam is in good shape with no apparent serious potential of failure. Maintenance of the downstream slope has been lax as evidenced by the tree growth. The embankment slopes and material in the embankment should provide adequate safety against shear. There is no sign of seepage on the downstream slope or along the toe.

SECTION 4 - OPERATIONAL PROCEDURES

4.1 PROCEDURES

There are no controlled outlet works other than a valve controlled 6-inch drawdown pipe. The pool level is controlled by rainfall, infiltration, evaporation, and the capacity of the uncontrolled spillways.

4.2 MAINTENANCE OF DAM

Maintenance of the dam is generally good, except for tree growth on the downstream slope.

4.3 MAINTENANCE OF OPERATING FACILITIES

No operating facilities other than the valve controlled 6-inch drawdown pipe exist at this dam.

4.4 DESCRIPTION OF ANY WARNING SYSTEM IN EFFECT

Upon checking with the owner, we are not aware of any warning system in effect for this dam.

4.5 EVALUATION

There does not appear to be any serious potential of failure of this structure.

SECTION 5 - HYDRAULIC/HYDROLOGIC

5.1 EVALUATION OF FEATURES

a. Design Data. No design data were found for this dam.

b. Experience Data. The drainage area, reservoir surface area, and elevation-storage data were developed from the USGS Bellflower South, Missouri, 7 1/2 minute topographic quadrangle map. The hydraulic computations for the spillway and dam overtopping discharge ratings were based on data collected in the field at the time of the field inspection.

c. Visual Observations.

(1) Entrance to the principal spillway is clear and free of trash. Trash rack appears in fair shape.

(2) There are some small willows and native shrubs in the entrance to the emergency spillway which should be cleaned out.

(3) The riprap on the upstream face of the dam appears in good condition and is evenly distributed.

d. Overtopping Potential. The spillways are too small to pass the probable maximum flood without overtopping. The spillway will pass the 100-year flood as well as 29% of the probable maximum flood without overtopping. The results of the routings through the dam are tabulated in regards to the following conditions:

Frequency	Inflow Discharge c.f.s.	Outflow Discharge c.f.s.	Maximum Pool Elevation	Freeboard Top of Dam Elev. 823.2	Time Dam Overtopping Hr.
0.5 PMF	4300	3700	823.8	- 0.6	4
PMF	8600	*8300	824.5	- 1.3	7
0.29 PMF	2500	1080	823.2	0	-

*Spillway Discharge = 2270 CFS
Top of Dam Discharge = 6030 CFS

According to the recommended guidelines from the Department of the Army, Office of the Chief of Engineers, this dam is classified as having a high hazard rating and an intermediate size. Therefore, the PMF is the test for the adequacy of the dam and its spillway.

The estimated damage zone is described in paragraph 1.2d in this report.

SECTION 6 - STRUCTURAL STABILITY

6.1 EVALUATION OF STRUCTURAL STABILITY

a. Visual Observation. This dam appears to be structurally stable. The 3H on 1V side slopes and the apparent materials in the embankment should provide adequate safety factors against shear failures. No seepage or deformation was observed. Tree growth on the downstream slope could ultimately cause potential of failure unless removed and controlled. The effects of overtopping on structural stability are not known.

b. Design and Construction Data. No design or construction data were available. Seepage and stability analyses comparable to the requirements of the "Recommended Guidelines for Safety Inspection of Dams" were not available, which is considered a deficiency.

c. Operating Records. There are no controlled operating facilities for this dam other than the valve controlled 6-inch drawdown pipe.

d. Post Construction Changes. It was reported that the principal spillway was modified in 1976 when the riser was added as an inlet. Prior to that time, the hooded 24-inch conduit was the only inlet structure. Additional riprap was also installed at the time the riser was added.

e. Seismic Stability. This dam is located in Seismic Zone 1. An earthquake of the magnitude predicted in this area is not expected to cause structural failure of this dam.

SECTION 7 - ASSESSMENT/REMEDIAL MEASURES

7.1 DAM ASSESSMENT

a. Safety. There does not appear to be any serious potential of failure of this dam. However, seepage and stability analyses comparable to the requirements of the "Recommended Guidelines for Safety Inspection of Dams" were not available which is considered a deficiency. Approximate analyses presented in Section 5 indicate that the spillways will pass the 100-year flood but will not pass the Probable Maximum Flood without overtopping. The Probable Maximum Flood will overtop the dam by 1.3 feet for a period of 7 hours. Additional studies would be required to determine the affects of such overtopping on structural and erosional stability of the dam. Trees should be removed from the embankment slopes to prevent ultimate damage and potential of failure.

b. Adequacy of Information. Due to the lack of engineering data, the conclusions in this report are based upon performance history and visual observations. Seepage and stability analyses comparable to the requirements of the "Recommended Guidelines for Safety Inspection of Dams" were not available, which is considered a deficiency.

c. Urgency. The item recommended in 7.2a should be pursued promptly.

d. Necessity for Phase II. Phase II investigation is not considered necessary.

e. Seismic Stability. This dam is located in Seismic Zone 1. An earthquake of this magnitude is not expected to be hazardous to this dam.

7.2 REMEDIAL MEASURES

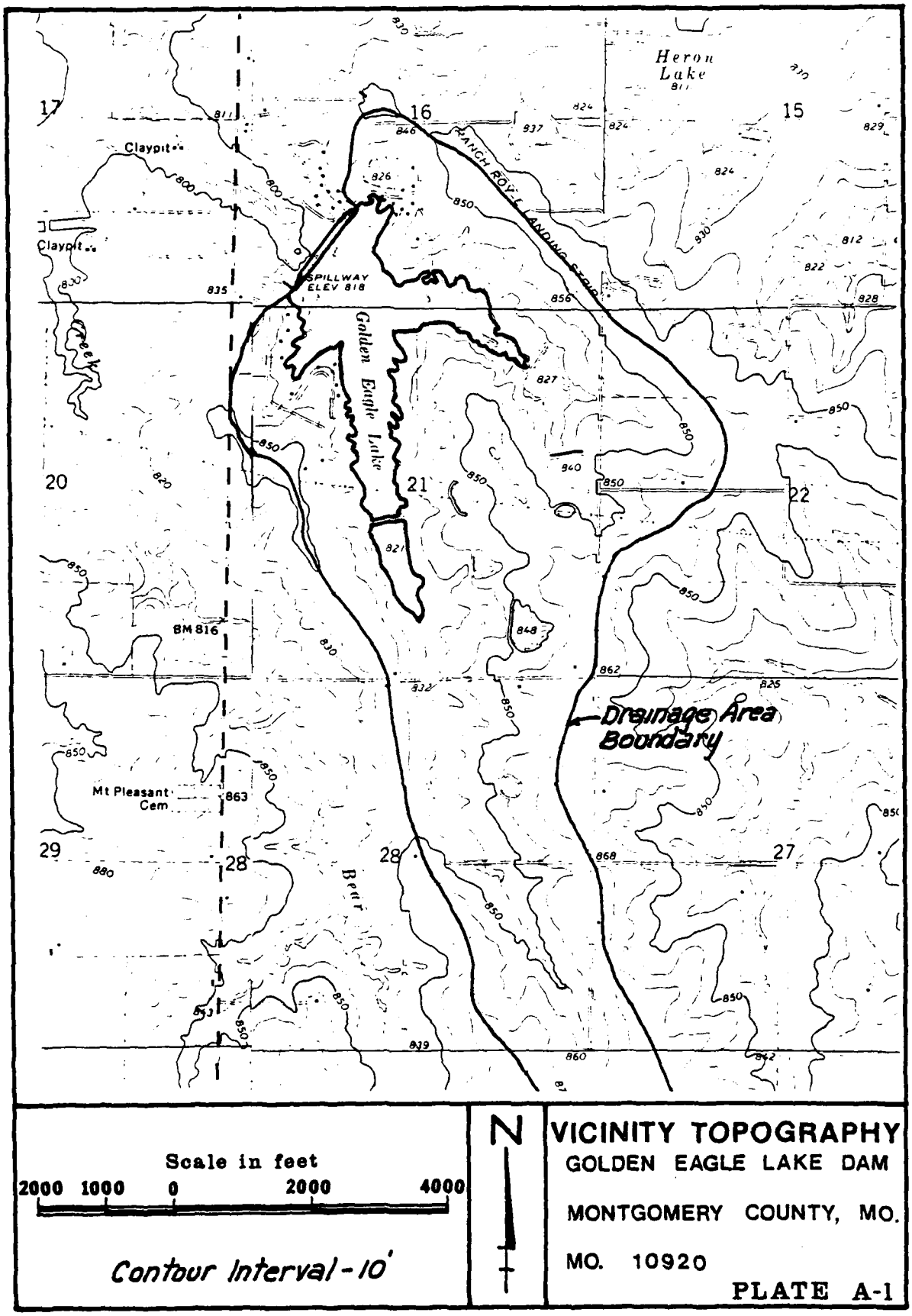
a. Alternatives. Additional information should be obtained on the topographic characteristics of the reservoir area to determine the increase in the height of dam or the size of the spillway that is necessary to pass the Probable Maximum Flood without overtopping the dam. The services of an engineer experienced in the design and construction of dams should be obtained to evaluate the present reservoir storage capacity, to provide seepage and stability analyses of the present dam, and to design protective measures, if required.

b. O & M Procedures.

(1) Trees should be removed from the slopes of the dam and measures taken to prevent their recurrence. Removal of large trees should be done under the guidance of an engineer experienced in the design and construction of earth dams.

(2) A program of periodic inspection and maintenance should be initiated to control tree growth on the dam.

APPENDIX A
MAPS



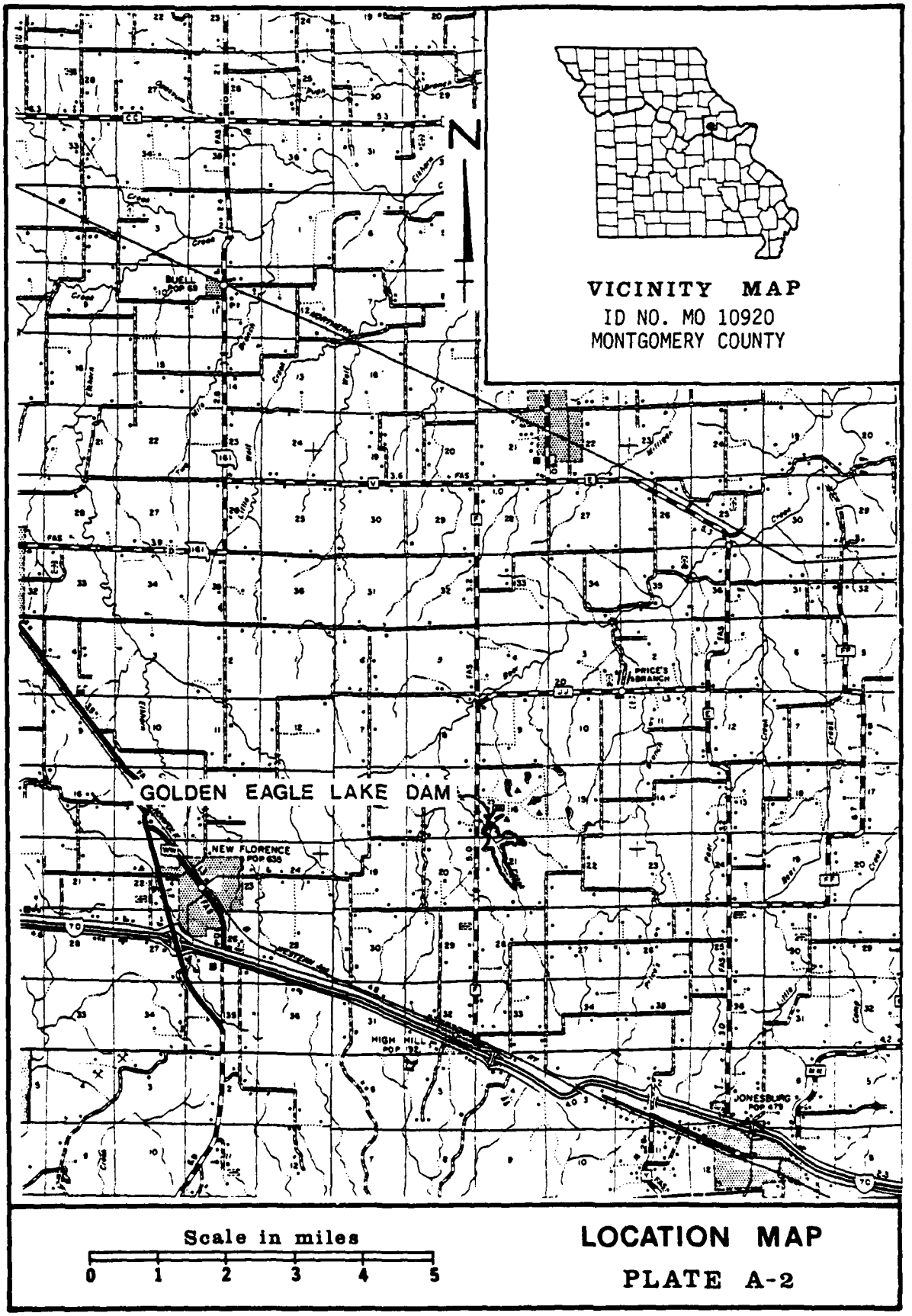
VICINITY TOPOGRAPHY

GOLDEN EAGLE LAKE DAM

MONTGOMERY COUNTY, MO.

MO. 10920

PLATE A-1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VICINITY MAP
ID NO. MO 10920
MONTGOMERY COUNTY
GOLDEN EAGLE LAKE DAM
BUELL POP 69
NEW FLORENCE POP 636
HIGH HILL POP 192
JONESBURG POP 673
PRICE'S BRANCH
Scale in miles
0 1 2 3 4 5
LOCATION MAP
PLATE A-2

APPENDIX B
PHOTOGRAPHS

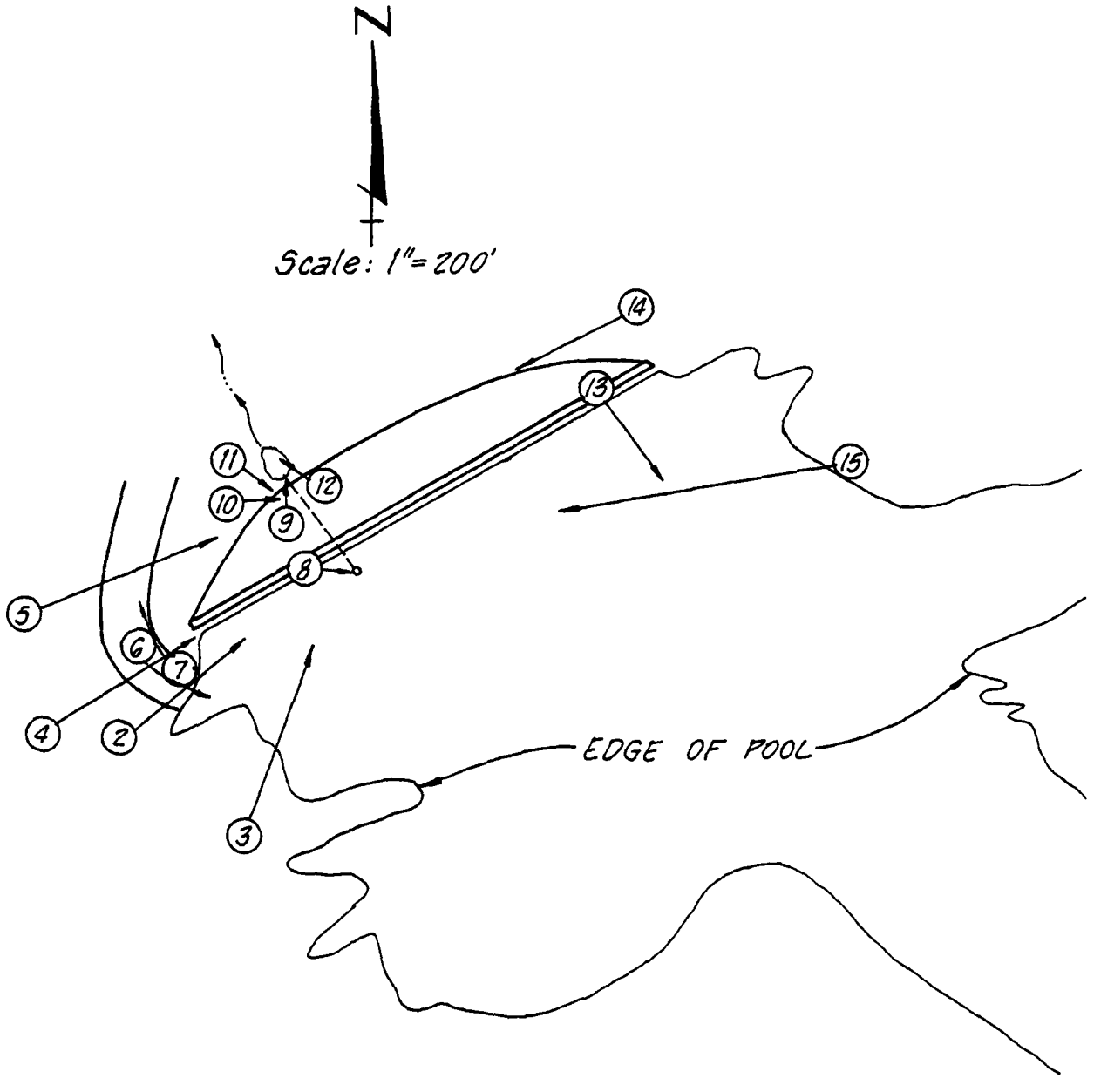


PHOTO INDEX

GOLDEN EAGLE LAKE DAM

MONTGOMERY COUNTY, MISSOURI

MO. 10920

PLATE B-1

PHOTO NO. 2 - UPSTREAM SLOPE FROM LEFT END

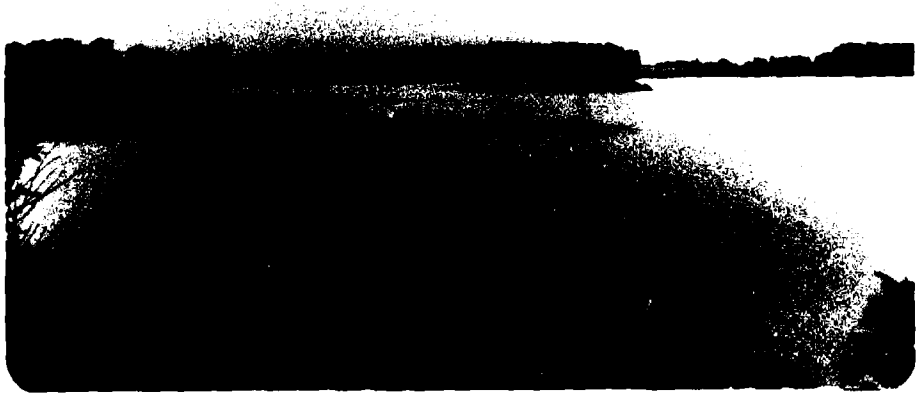


PHOTO NO. 3 - OVERVIEW FROM UPSTREAM ON LEFT SIDE

PHOTO NO. 4 - CREST TAKEN FROM LEFT ABUTMENT

PHOTO NO. 5 - DOWNSTREAM SLOPE TAKEN FROM LEFT SIDE

PHOTO NO. 6 - LOOKING UPSTREAM IN EMERGENCY SPILLWAY

PHOTO NO. 7 - LOOKING DOWNSTREAM IN EMERGENCY SPILLWAY

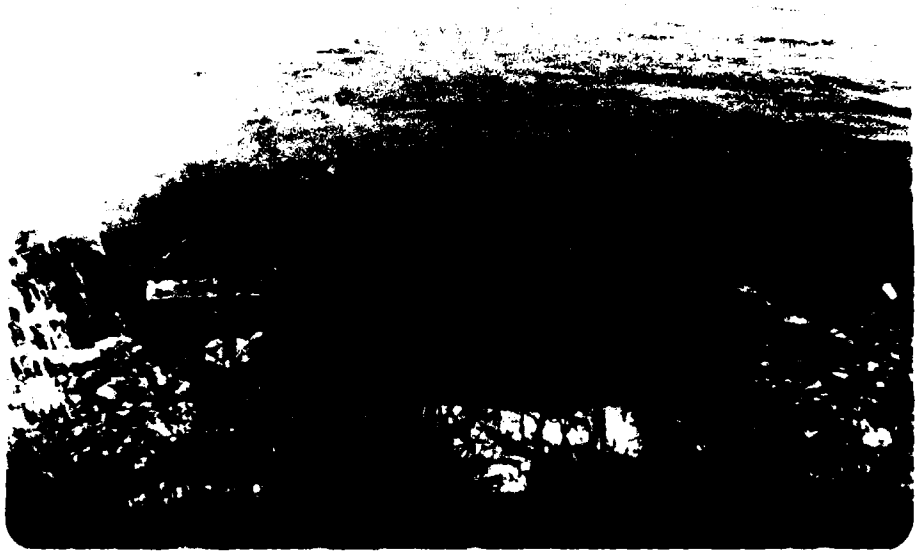


PHOTO NO. 8 - PRINCIPAL SPILLWAY RISER

PHOTO NO. 9 - OUTLET END OF PRINCIPAL SPILLWAY AND SCOUR HOLE

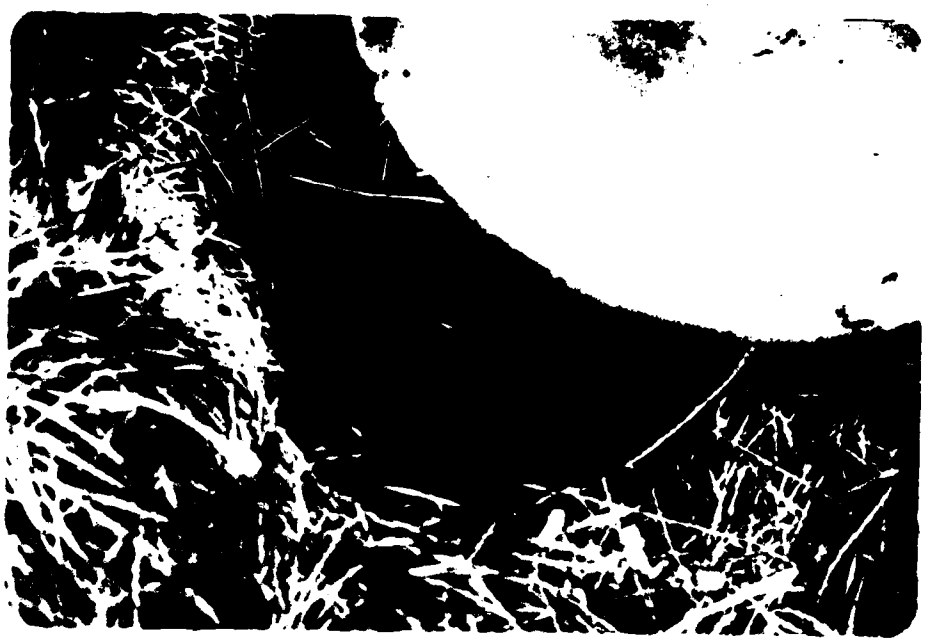


PHOTO NO. 10 - VALVE ON DOWNSTREAM END OF DRAWDOWN PIPE

PHOTO NO. 11 - OUTLET END OF DRAWDOWN PIPE

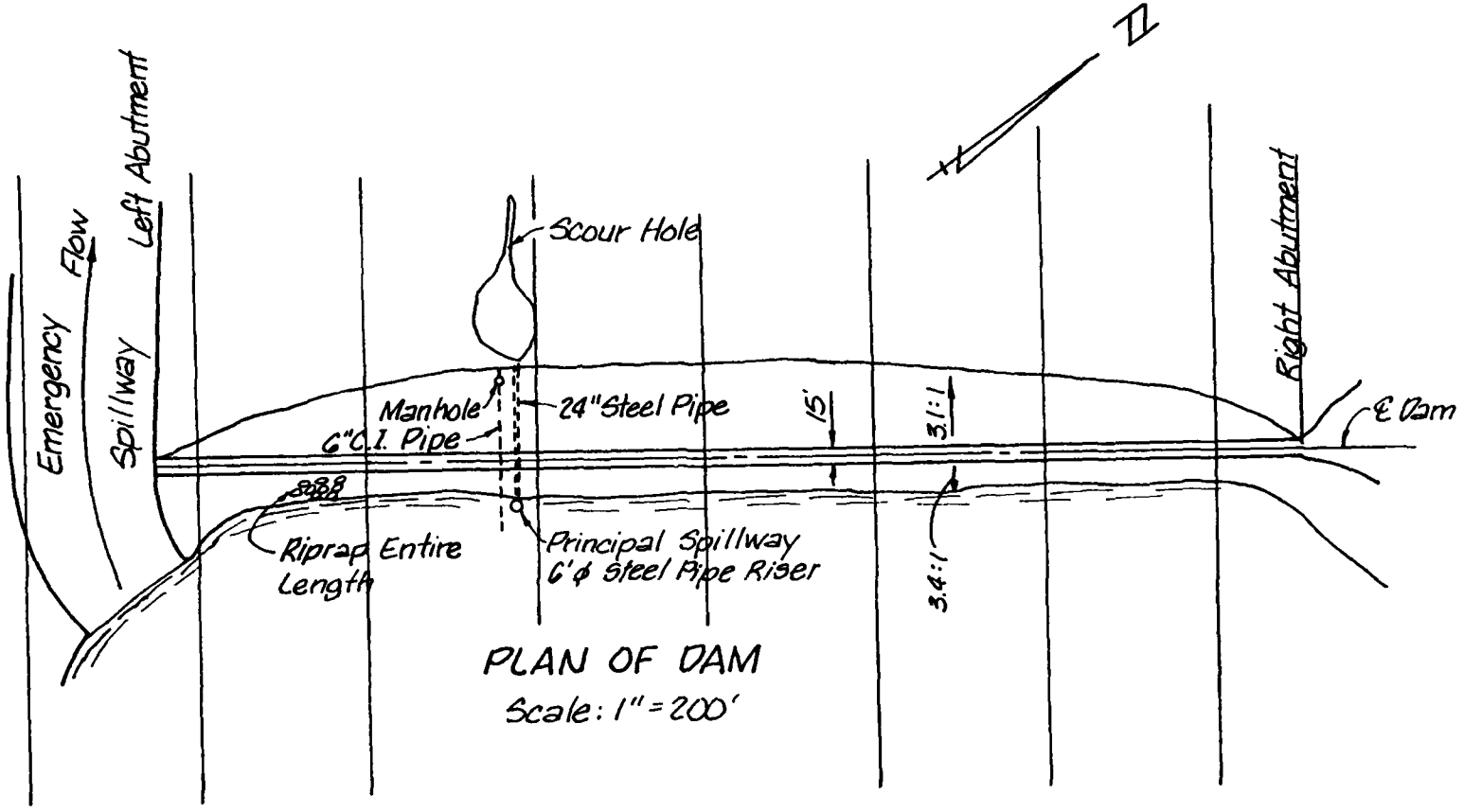
PHOTO NO. 12 - SCOUR HOLE AND DOWNSTREAM CHANNEL

PHOTO NO. 13 - VIEW ACROSS LAKE FROM RIGHT END

PHOTO NO. 14 - DOWNSTREAM SLOPE FROM RIGHT END

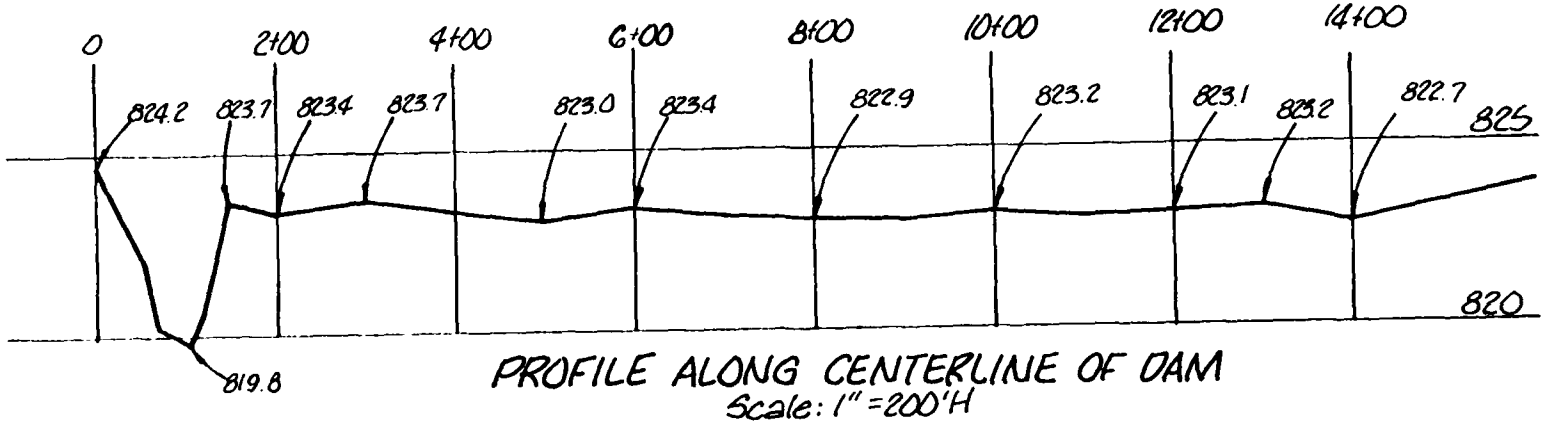
PHOTO NO. 15 - OVERVIEW FROM UPSTREAM ON RIGHT SIDE

APPENDIX C
PROJECT PLATES



PLAN OF DAM

Scale: 1" = 200'

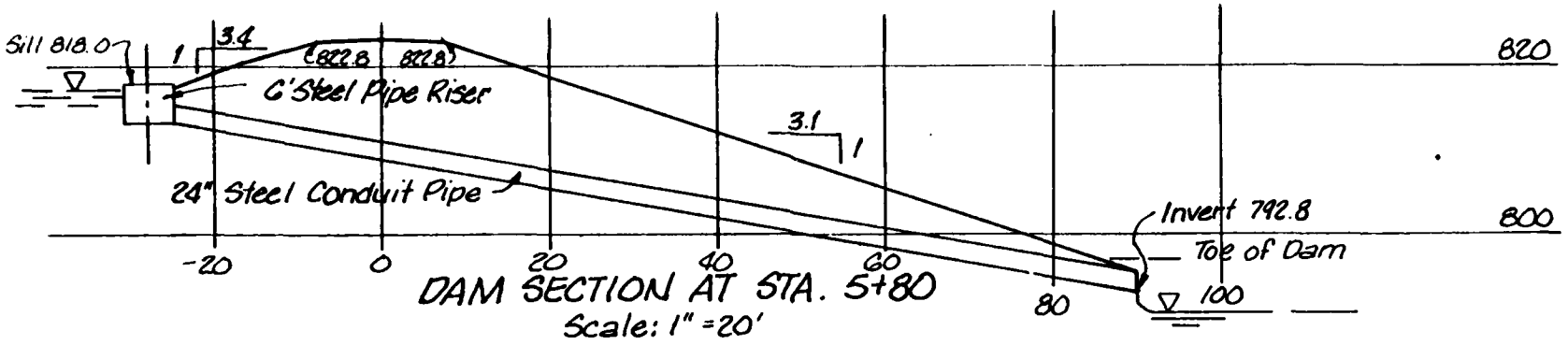


PROFILE ALONG CENTERLINE OF DAM

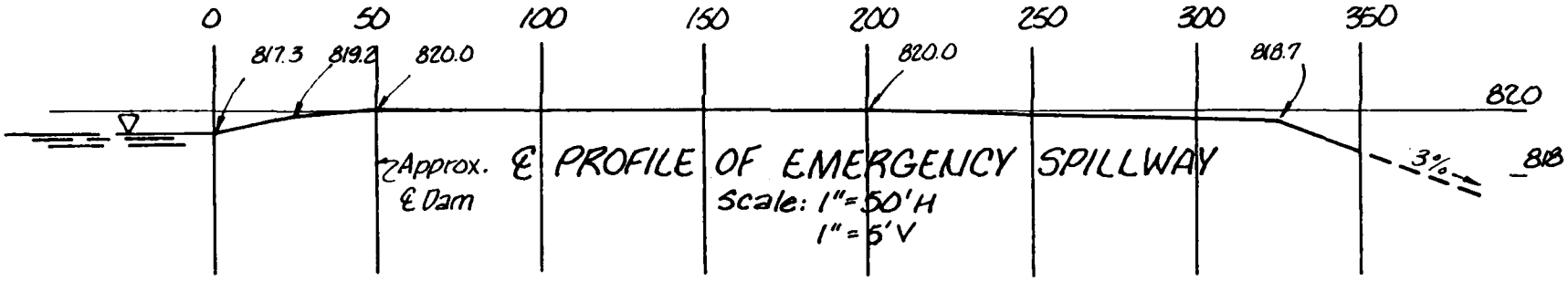
Scale: 1" = 200'H

1" = 5'V

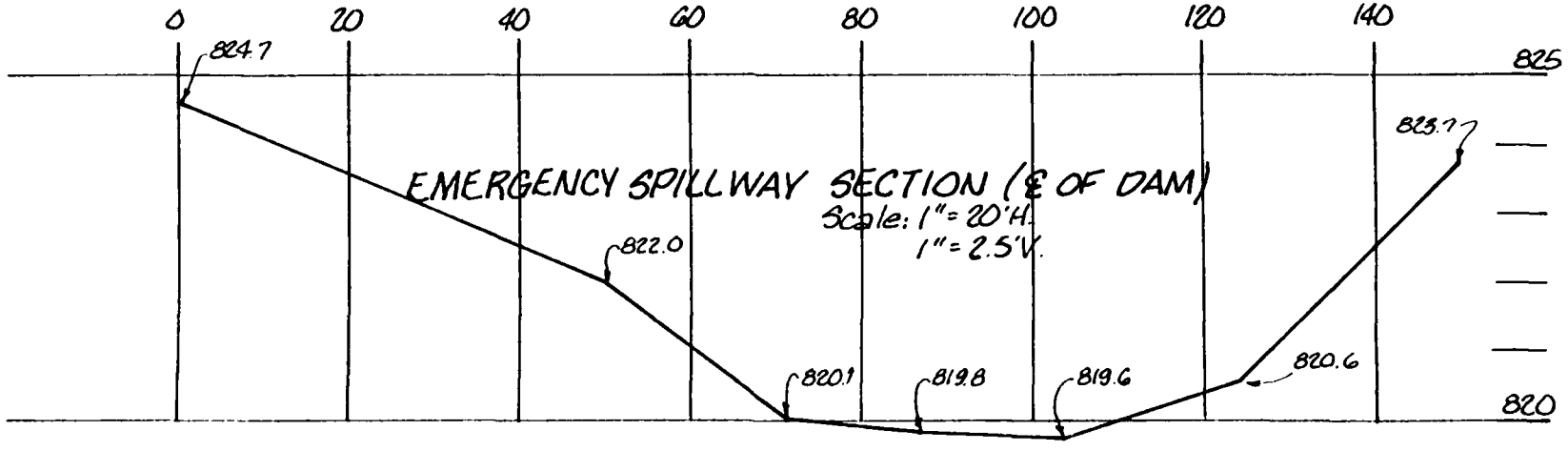
PLATE C-1



DAM SECTION AT STA. 5+80
Scale: 1" = 20'



℄ PROFILE OF EMERGENCY SPILLWAY
Scale: 1" = 50' H
1" = 5' V



EMERGENCY SPILLWAY SECTION (℄ OF DAM)
Scale: 1" = 20' H
1" = 2.5' V

PLATE C-2

APPENDIX D
HYDRAULIC AND HYDROLOGIC DATA

HYDROLOGIC COMPUTATIONS

1. The S.C.S. dimensionless unit hydrograph and the systemized computer program HEC-1 (Dam Safety Version), July 1978, prepared by the Hydrologic Engineering Center, U.S. Corps of Engineers, Davis, California, were used to develop the inflow hydrographs.

   a. Twenty-four hour, 100-year rainfall for the dam location was taken from the data for the rainfall station at Sullivan, Missouri, as supplied by the St. Louis District, Corps of Engineers per their letter dated 6 March 1979. The forty-eight hour probable maximum precipitation was taken from the curves of Hydrometeorological Report No. 33 and current Corps of Engineers and St. Louis policy and guidance for hydraulics and hydrology.

   b. Drainage area = 2.01 square miles (1,287 acres).

   c. Time of concentration of runoff = 130 minutes (computed from "Kirpich" formula).

   d. The antecedent storm conditions for the probable maximum precipitation were heavy rainfall and low temperatures which occurred on the previous 5 days (SCS AMC III). The antecedent storm conditions for the 100-year precipitation were an average of the conditions which have preceded the occurrence of the maximum annual flood on numerous watersheds (SCS AMC II). The initial pool elevation was assumed at the orifice opening of the riser.

   e. The total twenty-four hour storm duration losses for the 100-year storm were 1.59 inches. The total losses for the forty-eight hour PMF storm were 0.73 inches. These data are based on SCS runoff curve No. 94 and No. 86 for antecedent moisture conditions SCS AMC III and AMC II, respectively. The watershed is composed of primarily SCS soil groups C and D (Armster and Keswick soils) and consists mostly of cropland (small grain and row crop) and a small percentage of grass and alfalfa, and wooded area.

   f. Average soil loss rates = 0.02 inch per hour approximately.

2. The discharge ratings for the principal spillway were developed using equations for weir and full conduit flow. They are as follows:

a. Weir flow equation ($Qw=CLH^{3/2}$)
where C = weir coefficient = 3.5
L = length of weir, ft. = 18.85
H = total head, ft.

b. Full conduit flow equation ($Q = a\sqrt{\frac{2gh}{1+K_e+K_b+K_pL}}$)

Where a = cross-sectional area of pipe, ft^2=3.14
H = total head, ft.
K_e = coefficient for entrance loss = 0.5
K_b = coefficient for bend loss = 0.45
K_p = coefficient for pipe friction loss = 0.0144
L = length of pipe, ft. = 116.7

The emergency spillway discharge rating was developed using the Corps of Engineers Surface Water Profile HEC-2 computer program.

The flows over the dam crest were developed using the HEC-1 (Dam Safety Version) program with a discharge coefficient of 2.9 and a value of 1.5 for the exponent of head.

3. Floods were routed through the reservoir using the HEC-1 (Dam Safety Version) program to determine the capabilities of the spillway and dam embankment crest. The output and plotted hydrographs are shown in this appendix.

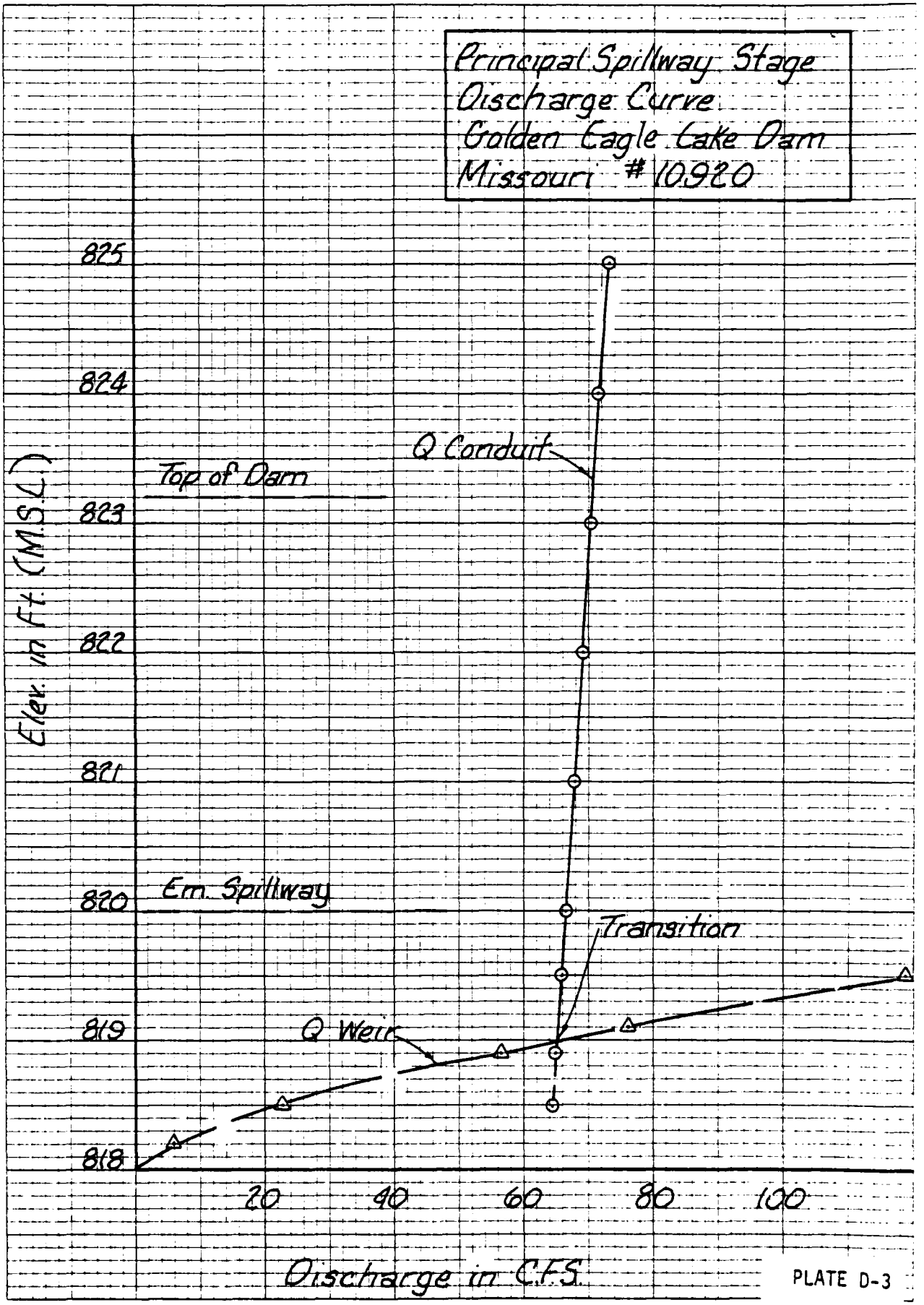


PLATE D-3

10 X 10 PER INCH

MADE IN U.S.A.

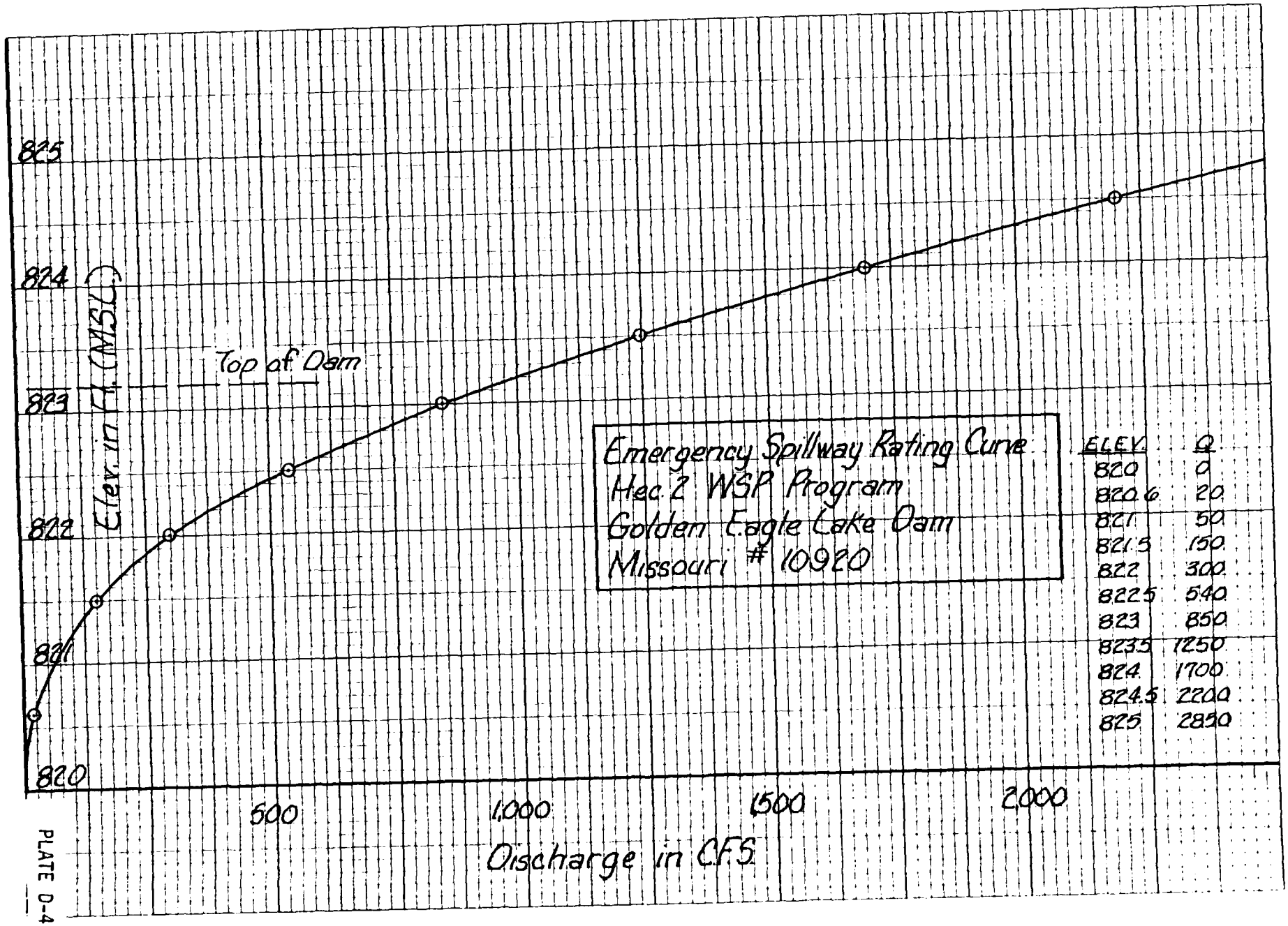


PLATE D-4

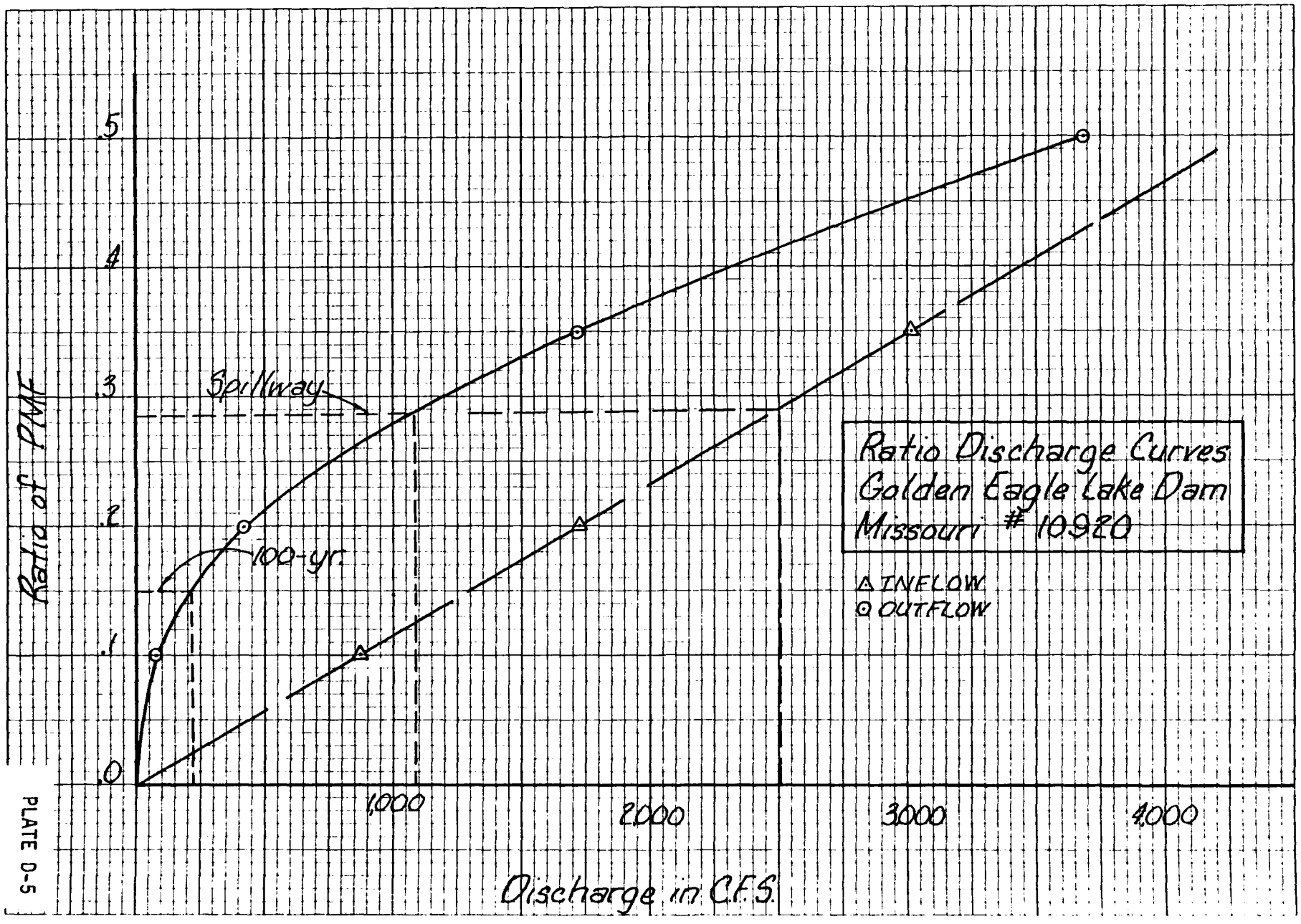


PLATE D-5

```
A1       ANALYSIS OF DAM OVERTOPPING USING RATIOS OF PMF
A2       HYDROLOGIC-HYDRAULIC ANALYSIS OF SAFETY OF GOLDEN EAGLE LAKE DAM 10920
A3       RATIOS OF PMF ROUTED THROUGH THE RESERVOIR
B C[illegible]CCCCCOC00015                          C0000000000000C000000003
B1C0000[illegible]
J 0OCCC1CCC0CCC070000J001
J1000.1CC0C0C.2000000.35C000C.5C00C00.650C0C0.80C00001.0
K 0C0CCCCC0C00001              0000000C00C0C0000C0CC0001
K1       CALCULATION OF INFLO HYDRO TO RES 10920
M CCCCC1CCC0C0C20CC02.C1       00002.01000001.0                    00000001
P CCC0C0C00024.800C001C2000001210000013000000140
T                                                   -1.0   -24.0       C0000.03
W2       CCCC1.30
X CC0000     -.C100000001
K 0000C1CCC00002               0000000200000CCC0000001
K1       ROUTED FLOWS THRU RES 10920
Y                         C0000CC100C00001
Y1C00001                                          -818.0      -1
Y4C818.C000818.2000818.5000818.9000819.0000819.5CC0820.0000820.6000821.0000821.5
Y4C822.0000822.5000823.C000823.5000824.0000824.5000825.0
Y5CCC0CCC0C0CCC60C0C0023C0000C5600000C650C0C0066C000066C000G087C0000118C0000218
Y50003E5C0000605000C092000001320000017700000227C00002920
$SC0CCCCCC00001100000022EC000037000000053C0CC0C7CCC00C089000001080
$E0818.0CCC819.0000820.CCC0821.0000822.00C0823.0C00824.000E825.0
$10818.C
$D0E23.2CC0002.500C001.500001350
K 000059
A
A
A
A
A
```

```
**********
FLOOD HYDROGRAPH PACKAGE (HEC-1)
DAM SAFETY VERSION      JULY 1978
  LAKE MODIFICATION  26 FEB 79
**********

RUN  DATE  79077/31.
     TIME  10.09.24.
```

ANALYSIS OF DAM OVERTOPPING USING RATIOS OF PMF
HYDROLOGIC-HYDRAULIC ANALYSIS OF SAFETY OF GOLDEN EAGLE LAKE DAM 10920
RATIOS OF PMF ROUTED THROUGH THE RESERVOIR

JOB SPECIFICATION

NC	NHR	NMIN	IDAY	IHR	IMIN	METRC	IPLT	IPRT	NSTAN
192	0	15	0	0	0	0	0	3	0

JOPER	NWT	IRCPT	ITRACE
5	0	0	0

MULTI-PLAN ANALYSES TO BE PERFORMED
NPLAN= 1 NRTIO= 7 LRTIO= 1

RTIOS= .10 .20 .35 .50 .65 .80 1.00

********** ********** ********** ********** **********

SUB-AREA RUNOFF COMPUTATION

CALCULATION OF INFLO HYDRO TO RES 10920

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
000001	0	0	0	0	0	1	0	0

HYDROGRAPH DATA

IHYDG	IUHG	TAREA	SNAP	TRSDA	TRSPC	RATIO	ISNOW	ISAME	LOCAL
1	2	2.01	0.00	2.01	1.00	0.000	0	1	0

PRECIP DATA

SPFE	PMS	R6	R12	R24	R48	R72	R96
0.00	24.80	102.00	121.00	130.00	140.00	0.00	0.00

LOSS DATA

LOSS	STRKR	STRTL	RTIOL	ERAIN	STRKS	RTIOK	STRTL	CNSTL	ALSMX	RTIMP
0	0.00	0.00	1.00	0.00	0.00	1.00	-1.00	-94.00	0.00	.03

CURVE NO = -94.00 WETNESS = -1.00 EFFECT CN = 94.00

UNIT HYDROGRAPH DATA
TC= 0.00 LAG= 1.30

RECESSION DATA
STRTQ= 0.00 QRCSN= -.01 RTIOR= 1.00

UNIT HYDROGRAPH 29 END OF PERIOD ORDINATES, TC= 0.00 HOURS, LAG= 1.30 VOL= 1.00

56.	171.	394.	560.	669.	677.	620.	529.	398.	287.
215.	164.	124.	92.	70.	52.	39.	29.	22.	17.
13.	9.	7.	6.	4.	3.	2.	1.		

MO.DA	HR.MN	PERIOD	RAIN	EXCS	LOSS	COMP Q	MO.DA	HR.MN	PERIOD	RAIN	EXCS	LOSS	COMP Q
						END-OF-PERIOD FLOW							
1.01	.15	1	.00	.00	.00	0.	1.02	.15	97	.04	.04	.00	23.
1.01	.30	2	.00	.00	.00	0.	1.02	.30	98	.04	.04	.00	29.
1.01	.45	3	.00	.00	.00	0.	1.02	.45	99	.04	.04	.00	40.
1.01	1.00	4	.00	.00	.00	0.	1.02	1.00	100	.04	.04	.00	57.
1.01	1.15	5	.00	.00	.00	0.	1.02	1.15	101	.04	.04	.00	78.
1.01	1.30	6	.00	.00	.00	0.	1.02	1.30	102	.04	.04	.00	100.
1.01	1.45	7	.00	.00	.00	0.	1.02	1.45	103	.04	.04	.00	119.
1.01	2.00	8	.00	.00	.00	0.	1.02	2.00	104	.04	.04	.00	136.
1.01	2.15	9	.00	.00	.00	0.	1.02	2.15	105	.04	.04	.00	149.
1.01	2.30	10	.00	.00	.00	0.	1.02	2.30	106	.04	.04	.00	158.
1.01	2.45	11	.00	.00	.00	0.	1.02	2.45	107	.04	.04	.00	165.
1.01	3.00	12	.00	.00	.00	0.	1.02	3.00	108	.04	.04	.00	170.
1.01	3.15	13	.00	.00	.00	0.	1.02	3.15	109	.04	.04	.00	174.
1.01	3.30	14	.00	.00	.00	0.	1.02	3.30	110	.04	.04	.00	177.
1.01	3.45	15	.00	.00	.00	0.	1.02	3.45	111	.04	.04	.00	179.
1.01	4.00	16	.00	.00	.00	0.	1.02	4.00	112	.04	.04	.00	181.
1.01	4.15	17	.00	.00	.00	0.	1.02	4.15	113	.04	.04	.00	183.
1.01	4.30	18	.00	.00	.00	0.	1.02	4.30	114	.04	.04	.00	184.
1.01	4.45	19	.00	.00	.00	0.	1.02	4.45	115	.04	.04	.00	185.
1.01	5.00	20	.00	.00	.00	0.	1.02	5.00	116	.04	.04	.00	185.
1.01	5.15	21	.00	.00	.00	0.	1.02	5.15	117	.04	.04	.00	186.
1.01	5.30	22	.00	.00	.00	0.	1.02	5.30	118	.04	.04	.00	186.
1.01	5.45	23	.00	.00	.00	0.	1.02	5.45	119	.04	.04	.00	186.
1.01	6.00	24	.00	.00	.00	0.	1.02	6.00	120	.04	.04	.00	187.
1.01	6.15	25	.02	.00	.01	0.	1.02	6.15	121	.20	.19	.00	196.
1.01	6.30	26	.02	.00	.01	1.	1.02	6.30	122	.20	.19	.00	223.
1.01	6.45	27	.02	.00	.01	1.	1.02	6.45	123	.20	.19	.00	278.
1.01	7.00	28	.02	.00	.01	1.	1.02	7.00	124	.20	.19	.00	365.
1.01	7.15	29	.02	.00	.01	1.	1.02	7.15	125	.20	.19	.00	469.
1.01	7.30	30	.02	.00	.01	1.	1.02	7.30	126	.20	.19	.00	575.
1.01	7.45	31	.02	.00	.01	2.	1.02	7.45	127	.20	.19	.00	672.
1.01	8.00	32	.02	.00	.01	3.	1.02	8.00	128	.20	.19	.00	755.
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1.01	12.45	51	.05	.03	.02	50.	1.02	12.45	147	.63	.63	.00	1264.
1.01	13.00	52	.05	.03	.02	63.	1.02	13.00	148	.63	.63	.00	1507.
1.01	13.15	53	.06	.04	.02	80.	1.02	13.15	149	.76	.76	.00	1803.
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1.01	13.45	55	.08	.04	.01	117.	1.02	13.45	151	.76	.76	.00	2434.
1.01	14.00	56	.08	.05	.01	137.	1.02	14.00	152	.76	.76	.00	2735.
1.01	14.15	57	.07	.06	.01	156.	1.02	14.15	153	.95	.95	.00	3004.
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1.01	17.45	71	.05	.05	.00	478.	1.02	17.45	167	.70	.70	.00	6814.
1.01	18.00	72	.05	.05	.00	428.	1.02	18.00	168	.70	.70	.00	6073.
1.01	18.15	73	.00	.00	.00	389.	1.02	18.15	169	.06	.06	.00	5482.
1.01	18.30	74	.00	.00	.00	352.	1.02	18.30	170	.06	.06	.00	4944.
1.01	18.45	75	.00	.00	.00	312.	1.02	18.45	171	.06	.06	.00	4364.
1.01	19.00	76	.00	.00	.00	267.	1.02	19.00	172	.06	.06	.00	3720.
1.01	19.15	77	.00	.00	.00	221.	1.02	19.15	173	.06	.06	.00	3083.
1.01	19.30	78	.00	.00	.00	179.	1.02	19.30	174	.06	.06	.00	2491.
1.01	19.45	79	.00	.00	.00	142.	1.02	19.45	175	.06	.06	.00	1977.
1.01	20.00	80	.00	.00	.00	112.	1.02	20.00	176	.06	.06	.00	1552.
1.01	20.15	81	.00	.00	.00	89.	1.02	20.15	177	.06	.06	.00	1231.
1.01	20.30	82	.00	.00	.00	72.	1.02	20.30	178	.06	.06	.00	997.
1.01	20.45	83	.00	.00	.00	60.	1.02	20.45	179	.06	.06	.00	822.
1.01	21.00	84	.00	.00	.00	50.	1.02	21.00	180	.06	.06	.00	688.
1.01	21.15	85	.00	.00	.00	43.	1.02	21.15	181	.06	.06	.00	588.
1.01	21.30	86	.00	.00	.00	37.	1.02	21.30	182	.06	.06	.00	514.
1.01	21.45	87	.00	.00	.00	33.	1.02	21.45	183	.06	.06	.00	457.
1.01	22.00	88	.00	.00	.00	30.	1.02	22.00	184	.06	.06	.00	412.
1.01	22.15	89	.00	.00	.00	28.	1.02	22.15	185	.06	.06	.00	378.
1.01	22.30	90	.00	.00	.00	26.	1.02	22.30	186	.06	.06	.00	351.
1.01	22.45	91	.00	.00	.00	24.	1.02	22.45	187	.06	.06	.00	332.
1.01	23.00	92	.00	.00	.00	23.	1.02	23.00	188	.06	.06	.00	320.
1.01	23.15	93	.00	.00	.00	23.	1.02	23.15	189	.06	.06	.00	311.
1.01	23.30	94	.00	.00	.00	22.	1.02	23.30	190	.06	.06	.00	304.
1.01	23.45	95	.00	.00	.00	22.	1.02	23.45	191	.06	.06	.00	299.
1.02	0.00	96	.00	.00	.00	22.	1.03	0.00	192	.06	.06	.00	295.
									SUM	34.72	33.99	.73	174413.
										1 882.31	863.11	19.11	4938.83)

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	8585.	5070.	1716.	909.	174261.
CMS	243.	144.	49.	26.	4935.
INCHES		23.46	31.76	33.60	33.60
MM		596.01	806.77	853.53	853.53
AC-FT		2514.	3403.	3600.	3600.
THOUS CU M		3101.	4198.	4441.	4441.

HYDROGRAPH AT STADOC001 FOR PLAN 1, RTIO 1

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	858.	507.	172.	91.	17426.
CMS	24.	14.	5.	3.	493.
INCHES		2.35	3.18	3.36	3.36
MM		59.60	80.68	85.35	85.35
AC-FT		251.	340.	360.	360.
THOUS CU M		310.	420.	444.	444.

HYDROGRAPH AT STA000001 FOR PLAN 1, RTIO 2

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	1717.	1014.	343.	182.	34852.
CMS	49.	29.	10.	5.	987.
INCHES		4.69	6.35	6.72	6.72
MM		119.20	161.35	170.71	170.71
AC-FT		503.	681.	720.	720.
THOUS CU M		620.	840.	888.	888.

HYDROGRAPH AT STA000001 FOR PLAN 1, RTIO 3

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	3005.	1775.	601.	318.	60992.
CMS	85.	50.	17.	9.	1727.
INCHES		8.21	11.12	11.76	11.76
MM		208.60	282.37	298.74	298.74
AC-FT		880.	1191.	1260.	1260.
THOUS CU M		1085.	1469.	1554.	1554.

HYDROGRAPH AT STA000001 FOR PLAN 1, RTIO 4 0.5 PMF

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	4292.	2535.	858.	454.	87131.
CMS	122.	72.	24.	13.	2467.
INCHES		11.73	15.88	16.80	16.80
MM		298.00	403.39	426.77	426.77
AC-FT		1257.	1702.	1800.	1800.
THOUS CU M		1551.	2099.	2221.	2221.

HYDROGRAPH AT STA000001 FOR PLAN 1, RTIO 5

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	5580.	3256.	1115.	590.	113270.
CMS	158.	93.	32.	17.	3207.
INCHES		15.25	20.65	21.84	21.84
MM		387.41	524.40	554.80	554.80
AC-FT		1634.	2212.	2340.	2340.
THOUS CU M		2016.	2729.	2887.	2887.

HYDROGRAPH AT STA000001 FOR PLAN 1, RTIO 6

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	6868.	4056.	1373.	726.	139409.
CMS	194.	115.	39.	21.	3948.
INCHES		18.77	25.41	26.88	26.88
MM		476.81	645.42	682.82	682.82
AC-FT		2011.	2723.	2880.	2880.
THOUS CU M		2481.	3358.	3553.	3553.

HYDROGRAPH AT STA000001 FOR PLAN 1, RTIO 7 PMF

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	8585.	5070.	1716.	908.	174261.
CMS	243.	144.	49.	26.	4935.
INCHES		23.46	31.76	33.60	33.60
MM		596.01	806.77	853.53	853.53
AC-FT		2514.	3403.	3600.	3600.
THOUS CU M		3101.	4198.	4441.	4441.

********** ********** ********** ********** **********

HYDROGRAPH ROUTING

ROUTED FLOWS THRU RES 10920

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
000002	1	0	0	2	0	1	0	0

ROUTING DATA

QLOSS	CLOSS	AVG	IRES	ISAME	IOPT	IPMP	LSTR
0.0	0.000	0.00	1	1	0	0	0

NSTPS	NSTDL	LAG	AMSKK	X	TSK	STORA	ISPRAT
1	0	0	0.000	0.000	0.000	-818.	-1

STAGE	818.00	818.20	818.50	818.90	819.00	819.50	820.00	820.60	821.00	821.50
	822.00	822.50	823.00	823.50	824.00	824.50	825.00			
FLOW	0.00	6.00	23.00	56.00	65.00	66.00	66.00	87.00	118.00	218.00
	369.00	609.00	920.00	1320.00	1770.00	2270.00	2920.00			
CAPACITY=	0.	110.	226.	370.	530.	700.	890.	1080.		
ELEVATION=	818.	819.	820.	821.	822.	823.	824.	825.		

CREL	SPWID	CCOW	EXPW	ELEVL	COQL	CAREA	EXPL
818.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

DAM DATA

TOPEL	COOD	EXPD	DAMWID
823.2	2.9	1.5	1350.

STATION 000002, PLAN 1, RATIO 1

END-OF-PERIOD HYDROGRAPH ORDINATES

CUTFLOW

0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	1.	1.	1.	1.
1.	1.	1.	1.	2.	2.	2.	3.	3.	3.
3.	4.	4.	4.	4.	4.	4.	5.	5.	5.
5.	5.	5.	5.	5.	5.	5.	5.	5.	5.
5.	5.	5.	5.	5.	5.	5.	5.	5.	5.
5.	5.	5.	5.	5.	5.	5.	5.	5.	5.
5.	5.	5.	5.	5.	6.	6.	6.	6.	6.

DVN

STATION 000002, PLAN 1, RATIO 1 PMF

END-OF-PERIOD HYDROGRAPH ORDINATES

OUTFLOW

0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	1.
1.	1.	1.	1.	1.	1.	1.	2.	2.	2.
2.	3.	3.	3.	4.	5.	6.	7.	9.	11.
13.	15.	18.	21.	27.	34.	42.	50.	58.	65.
65.	65.	65.	66.	66.	66.	66.	66.	66.	66.
66.	66.	66.	66.	66.	66.	66.	66.	66.	66.
66.	66.	66.	66.	66.	66.	66.	66.	66.	66.
66.	66.	66.	66.	66.	66.	66.	66.	66.	66.
66.	66.	66.	66.	66.	66.	66.	66.	66.	66.
66.	66.	66.	66.	66.	66.	66.	68.	71.	74.	78.
82.	86.	95.	104.	114.	131.	152.	174.	195.	215.
244.	273.	301.	328.	354.	388.	433.	487.	553.	640.
759.	892.	1053.	1485.	2124.	2721.	3211.	3613.	4030.	4603.
5435.	6486.	7481.	8111.	8290.	8069.	7572.	6926.	6284.	5701.
5146.	4576.	3998.	3429.	2897.	2424.	2024.	1706.	1458.	1267.
1129.	1059.	1011.	963.	916.	876.	837.	800.	765.	731.
700.	671.								

STORAGE

0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	1.	1.	1.	1.	2.	2.
2.	3.	3.	4.	4.	5.	5.	6.	7.	7.
8.	10.	11.	13.	15.	17.	20.	24.	27.	31.
36.	40.	46.	52.	60.	69.	80.	91.	102.	112.
121.	129.	136.	143.	148.	153.	156.	159.	161.	162.
163.	163.	163.	163.	163.	162.	161.	161.	160.	159.
158.	157.	157.	156.	155.	154.	153.	152.	152.	151.
151.	152.	153.	154.	155.	157.	159.	161.	163.	166.
168.	170.	173.	175.	177.	180.	182.	185.	187.	190.
192.	195.	199.	204.	211.	221.	232.	246.	260.	276.
293.	310.	327.	345.	362.	380.	398.	415.	431.	448.
464.	479.	494.	508.	522.	537.	553.	572.	595.	623.
656.	692.	732.	770.	802.	827.	845.	859.	873.	891.
915.	944.	970.	986.	990.	985.	973.	956.	939.	923.
907.	890.	872.	853.	833.	815.	798.	782.	768.	756.
744.	733.	722.	710.	699.	688.	677.	667.	658.	648.
640.	632.								

STAGE

818.0	818.0	818.0	818.0	818.0	818.0	818.0	818.0	818.0	818.0
818.0	818.0	818.0	818.0	818.0	818.0	818.0	818.0	818.0	818.0
818.0	818.0	818.0	818.0	818.0	818.0	818.0	818.0	818.0	818.0
818.0	818.0	818.0	818.0	818.0	818.0	818.0	818.0	818.0	818.0
818.0	818.0	818.0	818.0	818.0	818.0	818.0	818.1	818.1	818.1
818.1	818.1	818.1	818.1	818.1	818.2	818.2	818.2	818.2	818.3
818.3	818.4	818.4	818.5	818.5	818.6	818.7	818.8	818.9	819.0
819.1	819.2	819.2	819.3	819.3	819.4	819.4	819.4	819.4	819.5
819.5	819.5	819.5	819.5	819.5	819.4	819.4	819.4	819.4	819.4
819.4	819.4	819.4	819.4	819.4	819.4	819.4	819.4	819.4	819.4
819.4	819.4	819.4	819.4	819.4	819.4	819.4	819.4	819.5	819.5

819.5	819.5	819.5	819.6	819.6	819.6	819.6	819.6	819.7	819.7
819.7	819.7	819.8	819.8	819.9	820.0	820.0	820.1	820.2	820.3
820.5	820.6	820.7	820.8	820.9	821.1	821.2	821.3	821.4	821.5
821.6	821.7	821.8	821.9	822.0	822.0	822.1	822.2	822.4	822.5
822.7	823.0	823.2	823.4	823.5	823.7	823.8	823.8	823.9	824.0
824.1	824.3	824.4	824.5	824.5	824.5	824.4	824.3	824.3	824.2
824.1	824.0	823.9	823.8	823.7	823.6	823.5	823.4	823.4	823.3
823.2	823.2	823.1	823.1	823.0	822.9	822.9	822.8	822.8	822.7
822.6	822.6								

PEAK OUTFLOW IS 829C. AT TIME 41.25 HOURS

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	8290.	4864.	1474.	748.	143636.
CMS	235.	138.	42.	21.	4067.
INCHES		22.51	27.30	27.70	27.70
MM		571.82	693.30	703.53	703.53
AC-FT		2412.	2925.	2968.	2968.
THOUS CU M		2975.	3607.	3661.	3661.

PLATE D-13

STATION000002

INFLOW(I), OUTFLOW(O) AND OBSERVED FLOW(*)

	0.	1000.	2000.	3000.	4000.	5000.	6000.	7000.	8000.	9000.	0.	0.	0.
.15	1I												
.30	2I												
.45	3I												
1.00	4I												
1.15	5I												
1.30	6I												
1.45	7I												
2.00	8I												
2.15	9I												
2.30	10I												
2.45	11I												
3.00	12I												
3.15	13I												
3.30	14I												
3.45	15I												
4.00	16I												
4.15	17I												
4.30	18I												
4.45	19I												
5.00	20I												
5.15	21I												
5.30	22I												
5.45	23I												
6.00	24I												
6.15	25I												
6.30	26I												
6.45	27I												
7.00	28I												
7.15	29I												
7.30	30I												
7.45	31I												
8.00	32I												
8.15	33I												
8.30	34I												
8.45	35I												
9.00	36I												
9.15	37I												
9.30	38I												
9.45	39I												
10.00	40I												
10.15	41I												
10.30	42I												
10.45	43I												
11.00	44I												
11.15	45I												
11.30	46I												
11.45	47I												
12.00	48I												
12.15	49I												
12.30	50I												
12.45	51I												
13.00	52I												
13.15	53I												
13.30	54I												
13.45	55I												
14.00	56I												

PLATE D-14

PLATE D-15

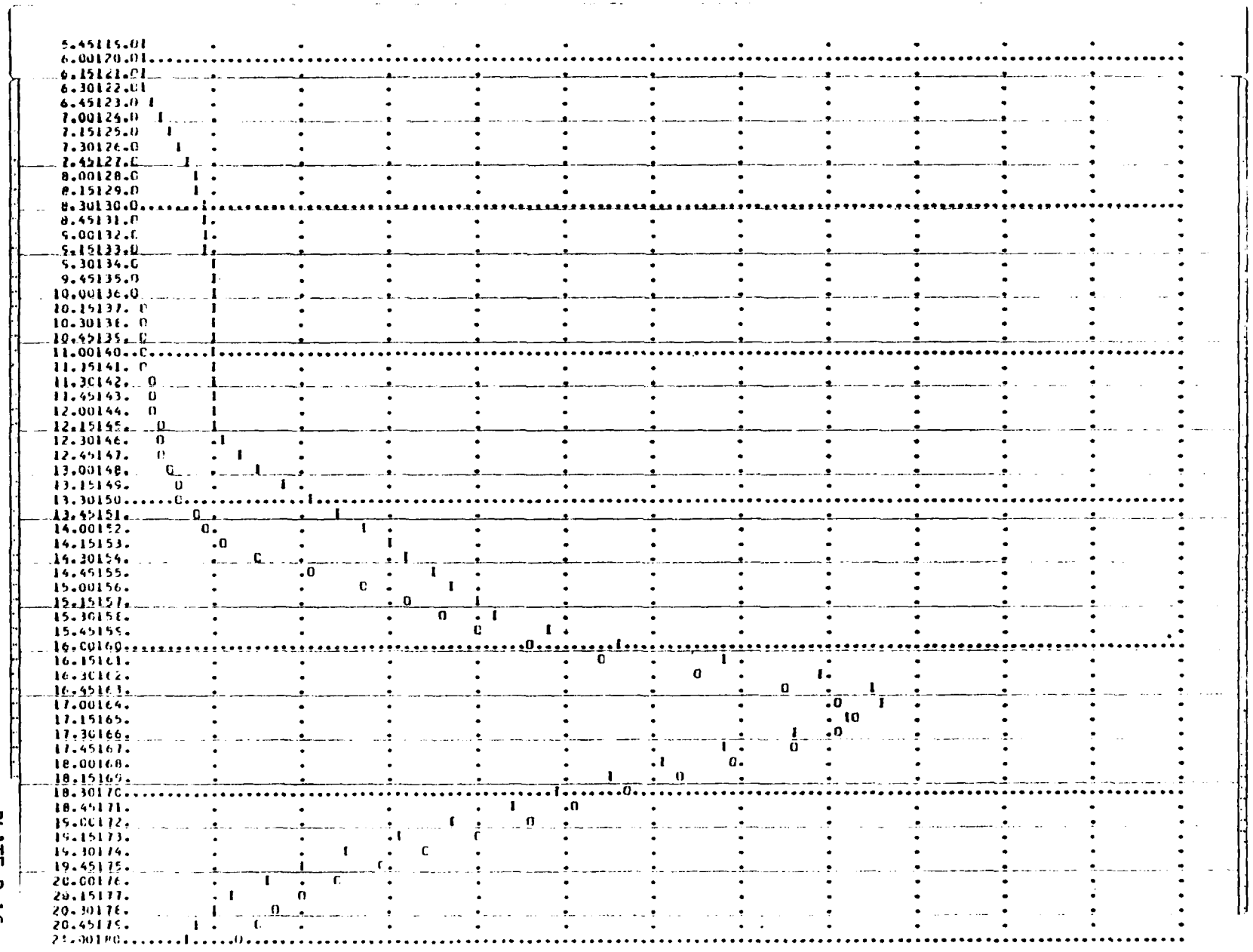

PLATE D-16

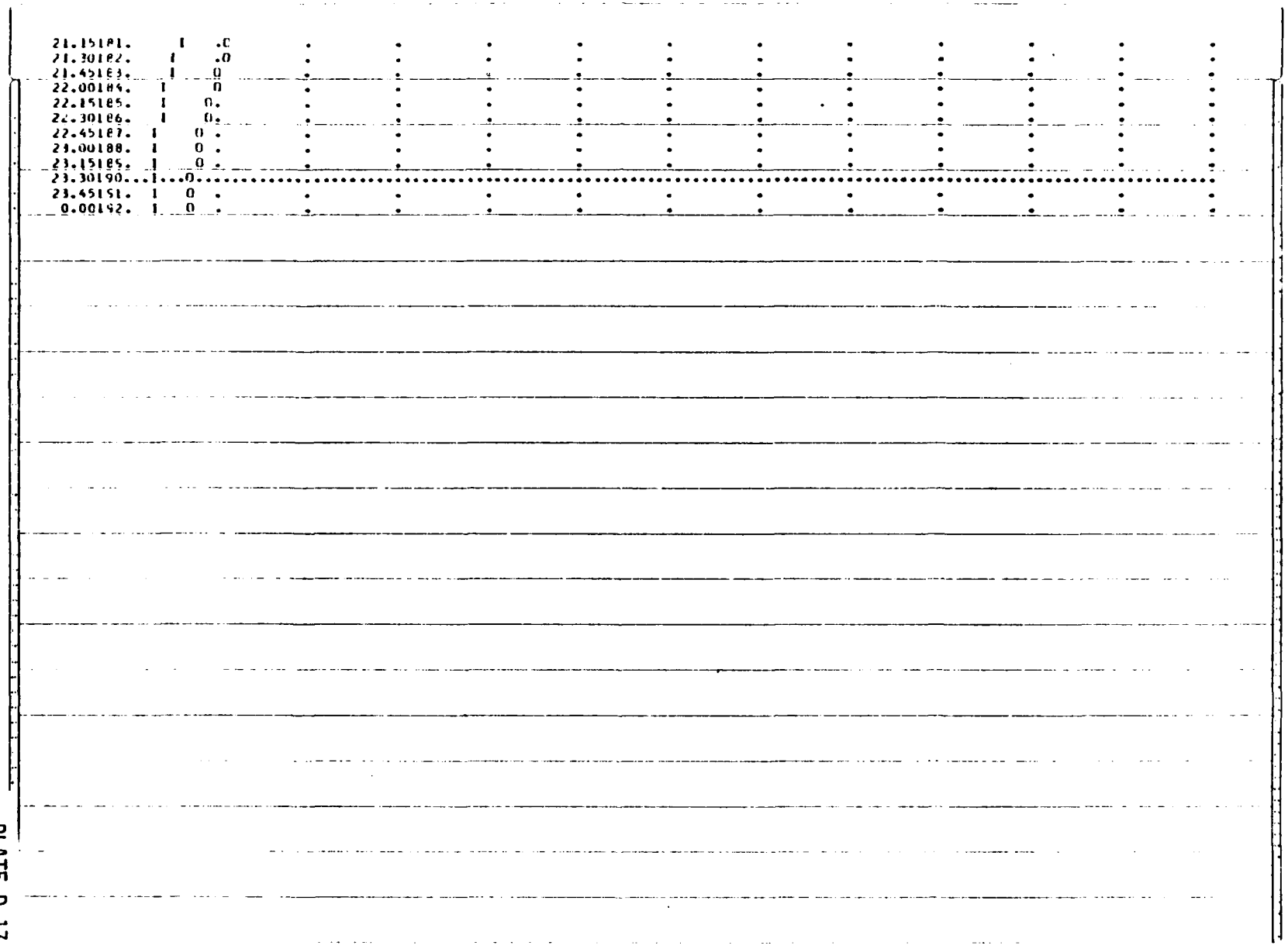

PLATE D-17

PEAK FLOW AND STORAGE (END OF PERIOD) SUMMARY FOR MULTIPLE PLAN-RATIO ECONOMIC COMPUTATIONS
FLOWS IN CUBIC FEET PER SECOND (CUBIC METERS PER SECOND)
AREA IN SQUARE MILES (SQUARE KILOMETERS)

OPERATION	STATION	AREA	PLAN	RATIOS APPLIED TO FLOWS						
				RATIO 1 .10	RATIO 2 .20	RATIO 3 .35	RATIO 4 .50	RATIO 5 .65	RATIO 6 .80	RATIO 7 1.00
HYDROGRAPH AT	000001	2.01	1	858.	1717.	3005.	4292.	5580.	6868.	8585.
	(	5.21)	(	24.31)(	48.62)(	85.08)(	121.55)(	158.01)(	194.47)(	243.09)(
ROUTED TO	000002	2.01	1	83.	417.	1720.	3683.	5230.	6577.	8290.
	(	5.21)	(	2.34)(	11.82)(	48.70)(	104.29)(	148.11)(	186.25)(	234.75)(

SUMMARY OF DAM SAFETY ANALYSIS

PLAN 1 .....

	INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
ELEVATION	818.00	818.00	823.20
STORAGE	0.	0.	730.
OUTFLOW	0.	0.	1080.

RATIO OF PMF	MAXIMUM RESERVOIR W.S.ELEV	MAXIMUM DEPTH OVER DAM	MAXIMUM STORAGE AC-FT	MAXIMUM OUTFLOW CFS	DURATION OVER TOP HOURS	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS
.10	820.47	0.00	294.	83.	0.00	44.75	0.00
.20	822.10	0.00	547.	417.	0.00	43.75	0.00
.35	823.44	.24	783.	1720.	2.50	42.50	0.00
.50	823.85	.65	861.	3683.	4.00	41.50	0.00
.65	824.10	.90	910.	5230.	5.00	41.25	0.00
.80	824.30	1.10	947.	6577.	6.00	41.25	0.00
1.00	824.53	1.33	990.	8290.	7.00	41.25	0.00

PLATE D-19


DAT
ILM